WHAT IS CLAIMED IS:

1. A process of producing a purified compressed gas comprising:

a) providing a gas feed;

b) providing at least one rotary adsorber having a multiplicity of passages through which compressed gas can flow for adsorbing impurities therefrom, the rotary adsorber capable of adsorption of impurities from said compressed gases and of regeneration on a continuous basis as the wheel rotates;

c) after said gas feed has been compressed to produce a compressed gas feed, sending said compressed gas feed through a regeneration sector of said rotary adsorber wherein said compressed gas feed removes impurities from said regeneration sector of said rotary adsorber and produces a contaminated stream of compressed gas containing said impurities;

d) then cooling said contaminated stream of compressed gas and condensing condensable impurities from said contaminated stream of compressed gas within a condensing means, removing a quantity of condensed impurities from said condensing means and thereby producing a cooled stream of compressed gas; and

e) then passing said cooled stream of compressed gas to an adsorption sector of said rotary adsorber wherein a further quantity of impurities are removed from said compressed gas to produce a purified compressed gas product.

2. The process of claim 1 wherein said compressed gas feed is heated to a desired temperature.

3. The process of claim 2 wherein said compressed gas feed is heated by auxiliary heating means.

4. The process of claim 2 wherein said compressed gas feed is heated by natural heating means.

5. The process of claim 2 wherein said effluent of said regeneration sector is heat exchanged, prior to cooling, with said compressed gas feed.

6. The process of claim 1 wherein said compressed gas feed has been compressed by passing through a compressor.

7. The process of claim 1 wherein said purified compressed gas product is cooled to a desired temperature to produce a cooled purified compressed gas product.

8. The process of claim 1 wherein a minor portion of said cooled purified compressed gas product, having been cooled to a desired temperature, is sent to a cooling sector of said rotary adsorber to cool said cooling sector.

9. The process of claim 8 wherein after said minor portion of cooled compressed purified gas cools said cooling sector, said minor portion of cooled compressed purified gas is combined with said compressed gas feed.

10. The process of claim 9 wherein said minor portion of cooled compressed purified gas is returned to said compressed gas feed after compression of said gas feed and before said compressed gas feed passes through said regeneration sector of said rotary adsorber.

11. The process of claim 8 wherein said minor portion of cooled compressed purified gas is returned to said gas feed before compression of said gas feed.

12. The process of claim 9 wherein said minor portion of cooled compressed purified gas is boosted in pressure by a pressure boosting means and then returned to said gas feed after said gas feed is compressed.

13. The process of claim 8 wherein said minor portion is returned to said gas feed prior to said gas feed passing to said compressor.

14. The process of claim 1 wherein said gas is air or hydrocarbons.

15. The process of claim 14 wherein said gas is air.

16. The process of claim 14 wherein said gas is selected from the group consisting of ethylene and natural gas.

17. The process of claim 1 wherein said impurities are selected from the group consisting of water, hydrochloric acid, fluorocarbons, and hydrofluorocarbons.

18. The process of claim 1 wherein said compressed gas feed travels in a direction in said rotary adsorber counter-current to said cooled stream of compressed gas.

19. The process of claim 8 wherein said minor portion of said purified compressed gas product travels co-current to said compressed gas feed in said rotary adsorber.

20. The process of claim 8 wherein said minor portion comprises about 3 to 15% by volume of said purified compressed gas product.

21. The process of claim 1 wherein said purified compressed gas product comprises between 10 and 250 parts per million water.

22. A process of producing dry compressed air comprising:

a) first sending a stream of air to at least one air compressor to produce a stream of heated, compressed air;

b) then passing said heated compressed air through a regeneration sector of a rotary adsorber to remove water from said regeneration sector of said rotary adsorber and thereby producing a cooled wet stream of compressed air;

c) then passing said cooled wet stream of compressed gas through a heat exchanger to produce a cooler stream of compressed gas and to condense and remove a portion of water from said cooled wet stream;

d) after said portion of water is removed, passing said cooler stream of compressed air to an adsorption sector of said rotary adsorber wherein a further quantity of water is removed from said cooler stream of compressed air to produce a dried compressed air product stream and wherein said adsorption sector adsorbs water from said cooler stream of compressed air;

e) passing said purified compressed gas product through a second heat exchanger to cool said purified compressed gas product to a desired temperature; and

f) removing from said cooled purified compressed gas product a minor portion of cooled purified compressed gas, wherein said minor portion is sent to a cooling sector of said rotary adsorber to cool said cooling sector.

23. A process of producing purified compressed gases comprising:

a) rotating a sector of a rotary adsorber through N adsorption zones designated from 1 to N, wherein N is an integer from 2 to 10, then rotating said sector of

said rotary adsorber through M regeneration zones designated from 1 to M, wherein M is an integer from 2 to 10, and then rotating said sector of said rotary adsorber through P cooling zones, wherein P is an integer from 0 to 5 and wherein when P is greater than 0, said adsorber zone rotates from cooling zone 1 to P and then back to adsorber zone 1 to establish a continuous adsorption, regeneration, and cooling cycle;

b) sending a compressed gas feed stream through regeneration zone M to remove at least one impurity from said regeneration zone, and producing an effluent enhanced in the impurity;

c) M-1steps sending the effluent from regeneration zone H, where H is an integer and decrements from M to 2 with each step, into regeneration zone H-1 to remove at least one impurity from said regeneration zone, and producing an effluent enhanced in the impurity;

d) cooling the effluent stream from regeneration zone 1, condensing a portion of the impurities, and removing the impurities thereby producing a cooled stream of compressed gas;

e) sending the cooled stream of compressed gas through adsorption zone N of said rotary adsorbent to adsorb at least one impurity on the adsorber and produce an effluent stream depleted in at least one impurity;

f) N-1 step(s) sending the effluent stream from adsorption zone K, where K is an integer and decrements from N to 2 with each step, into adsorption zone K-1 to adsorb at least one impurity on the adsorber and produce an effluent stream

depleted in at least one impurity, the effluent from step N-1 being a purified product stream;

g) wherein if P is greater than 0, cooling at least a portion of the purified product stream and sending it through cooling zone P, to cool the adsorber and produce an effluent stream with greater enthalpy of if P is zero, and wherein if P is 0, skipping this cooling step g) and proceeding to step h); and

h) if P is greater than 1, P-1 steps sending the effluent from cooling zone L, where L is an integer to cool the adsorber and producing an effluent stream with greater enthalpy and if P is 1, skipping this step h).

24. The process of claim 23 wherein one or more of the effluent streams from adsorption zone 2 to N are cooled before being sent to the next adsorption zone or said rotary adsorber.

25. The process of claim 23 wherein one or more of the effluent streams from regeneration zones 2 to M are heated before being sent to the next regeneration zone of said rotary adsorber.

26. The process of claim 23 wherein the streams flow through the adsorption zones of the rotary adsorber co-currently to each other, and counter-currently to the streams flowing through the regeneration and cooling zones.

27. An adsorbent wheel system comprising at least one adsorption sector, at least one regeneration sector and at least one cooling sector, wherein said adsorbent wheel system comprises one or more adsorbent wheels, each of said adsorbent wheels comprising a two flat sides, parallel to a diameter of said adsorbent wheel and a

continuous round edge parallel to an axis of rotation of said adsorbent wheel wherein a flow of compressed gas to be treated is first sent through said regeneration sector, followed by passage of said flow of compressed gas through a condenser to condense and remove impurities in said gas, then to said cooling sector to cool said adsorbent wheel and then to said adsorption sector to remove at least one impurity from said gas stream.

28. A process of producing purified compressed gases in a two rotary contactor system wherein said two rotary contactor system comprises a first rotary adsorber and a second rotary adsorber, each of said first and second rotary adsorbers comprising a regeneration sector, an adsorption sector and a cooling sector, said process comprising:

a) providing a flow of compressed gas feed;

b) providing a first rotary adsorber and a second rotary adsorber, wherein each of said rotary adsorbers comprises a regeneration sector, an adsorption sector and a cooling sector;

c) first sending said compressed gas feed through said regeneration sector of said first rotary adsorber to remove impurities from said regeneration sector of said first rotary adsorber and producing a contaminated stream of compressed gas containing said impurities;

d) then cooling said contaminated stream of compressed gas and condensing a portion of impurities from said contaminated stream of compressed gas, removing a quantity of said condensed impurities and thereby producing a cooled stream of compressed gas;

e) then passing said cooled stream of compressed gas to an adsorption sector of said first rotary adsorber wherein a further quantity of contaminants are removed from said compressed gas to produce a purified compressed gas product;

f) then passing said purified compressed gas product to an adsorption sector of said second rotary adsorber wherein said adsorption sector removes a majority of remaining condensable impurities and producing a final product gas stream; and

g) diverting a minor portion of said final product gas streams into at least two recycle gas streams;

wherein one of said recycle gas streams is heated and then sent through a regeneration sector of said second rotary adsorber and a second of said recycle gas streams is cooled and is sent through a cooling sector of said second rotary adsorber, and then the two recycle streams are reintroduced into the gas stream either prior to sending the compressed gas feed to the regeneration zone of the first rotary adsorber, or prior to sending the cooled stream of compressed gas to the adsorption sector of the first rotary adsorber, or at both points.

29. The process of claim 28 wherein the two recycle streams are combined prior to being reintroduced into the gas stream.

30. The process of claim 28 wherein the combined recycle stream passes through the cooling sector of the first rotary adsorber.

31. The process of claim 28 wherein after exiting the cooling sector of the first rotary adsorber, the combined recycle stream is boosted in pressure, and combined with the compressed gas feed prior to said stream being sent to the regeneration zone of the first rotary adsorber.

32. The process of claim 28 wherein after exiting the cooling sector of the first rotary adsorber, the combined recycle stream is boosted in pressure, and combined with the cooled stream of compressed gas prior to said stream being sent to the adsorption zone of the first rotary adsorber.

33. The process of claim 28 wherein the regeneration stream for said second rotary adsorber travels in a direction counter-current to the direction of flow in said second rotary adsorber adsorption sector.

34. The process of claim 28 wherein the second rotary adsorber cooling stream travels in a direction counter-current to the direction of the flow in the second rotary adsorption sector.

35. The process of claim 28 wherein the second rotary regeneration effluent stream is combined with the second rotary cooling sector effluent stream prior to boosting the pressure.

36. The process of claim 35 wherein the combined stream passes through the cooling sector of the first rotary adsorber, and is combined with the main process flow upstream of the regeneration sector of the first rotary adsorber.

37. The process of claim 35 wherein the combined stream flows through the first rotary adsorber cooling sector in a direction counter-current to the flow through the first rotary adsorber adsorption sector.

38. The process of claim 35 wherein said combined recycle streams are sent through a pressure booster and then pass through the cooling sector of said first rotary adsorber.

39. The process of claim 28 wherein said there is a sharing of heat between said contaminated flow and said compressed gas feed.

40. A two-stage dryer for producing a low moisture gas stream comprising:

a) at least two rotary contactors, each rotary contactor having a multiplicity of passages, through which compressed gas can flow, for adsorbing impurities therefrom, the rotary contactors being capable of adsorption of impurities from said compressed gases and of regeneration on a continuous basis as the wheel rotates and each of said rotary contactors comprising at least one adsorbent, regeneration and cooling sector;

b) means to provide a compressed flow of a moisture containing gas to said regeneration sector of a first of said two rotary contactors;

c) means to send said compressed flow of a moisture containing gas from said regeneration sector to a condensing means wherein condensed impurities are removed to produce a dried flow of gas;

d) means to send said dried flow of gas through an adsorption zone of said first rotary contactor;

e) means to send said dried flow of gas from said adsorption zone of said first rotary contactor through an adsorption zone of said second rotary contactor to produce a very dry gas product stream;

f) means to send a majority portion of said very dry gas stream to be used as product; and

g) means to send two minority portions of said very dry gas stream, a first of said minority portions to be first heated to a desired temperature and then to be sent to a regeneration zone of said second rotary contactor and a second of said minority portions to be cooled to a desired temperature and then to be sent to a cooling zone of said rotary contactor.

41. The two-stage dryer of claim 40 wherein said first of said minority portions passes through a pressure boosting means after passing through said regeneration sector and then is returned to said moisture containing gas.

42. The two-stage dryer of claim 40 wherein said second of said minority portions passes through a pressure boosting means after passing through said cooling sector and then is returned to said moisture containing gas.